PLP1 gene

proteolipid protein 1

Normal Function

The *PLP1* gene provides instructions for producing proteolipid protein 1 and a modified version (isoform) of proteolipid protein 1, called DM20. Proteolipid protein 1 and DM20 are primarily located in the brain and spinal cord (central nervous system) and are the main proteins found in myelin. Myelin is the fatty covering that insulates nerve fibers and promotes the rapid transmission of nerve impulses. DM20 is primarily involved in the formation of myelin before birth, while proteolipid protein 1 is the predominant protein after birth.

Health Conditions Related to Genetic Changes

Pelizaeus-Merzbacher disease

There are more than 100 mutations in the *PLP1* gene that cause Pelizaeus-Merzbacher disease. Several types of mutations are associated with the condition, and to some extent, the type of mutation can affect the severity of the disease. The most common mutation type is a duplication of the *PLP1* gene, which accounts for 50 percent to 70 percent of all Pelizaeus-Merzbacher disease mutations. *PLP1* gene duplications are generally associated with the classic form of Pelizaeus-Merzbacher disease. In many cases, genes near the *PLP1* gene are also duplicated, but having extra copies of these genes does not make the disease more severe. Occasionally, deletion of the entire *PLP1* gene can also cause classic Pelizaeus-Merzbacher disease. Mutations that change one protein building block (amino acid) in a critical area of the proteolipid protein 1 and DM20 proteins usually cause the more severe connatal form of Pelizaeus-Merzbacher disease. All of these mutations disrupt the ability of proteolipid protein 1 and DM20 to form myelin. A lack of myelin causes nerve cell dysfunction in the central nervous system, which results in the signs and symptoms of Pelizaeus-Merzbacher disease.

spastic paraplegia type 2

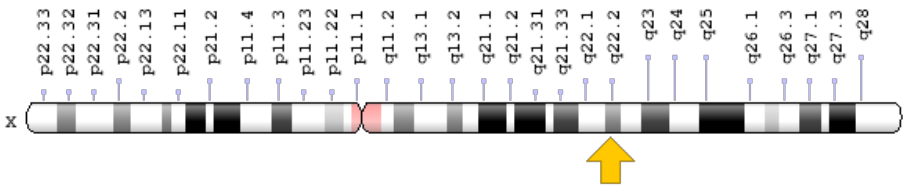
More than 10 mutations in the *PLP1* gene that cause spastic paraplegia type 2 have been identified. Most mutations change one protein building block (amino acid) in a non-critical area of the proteolipid 1 protein. Some of these mutations disrupt the production of the proteolipid 1 protein but do not interfere with the production of its isoform, DM20. Generally, deletion of the entire *PLP1* gene can also cause spastic paraplegia type 2, typically the complex type. Any change in the proteolipid 1 protein appears to disrupt its function, but the mutations that cause spastic paraplegia type 2

seem to have a less detrimental effect on myelin production than the mutations that cause more serious cases of Pelizaeus-Merzbacher disease.

Chromosomal Location

Cytogenetic Location: Xq22.2, which is the long (q) arm of the X chromosome at position 22.2

Molecular Location: base pairs 103,776,506 to 103,792,619 on the X chromosome (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- lipophilin
- major myelin proteolipid protein
- MMPL
- MYPR_HUMAN
- PLP
- PLP/DM20
- PMD
- proteolipid protein 1 (Pelizaeus-Merzbacher disease, spastic paraplegia 2, uncomplicated)
- SPG2

Additional Information & Resources

GeneReviews

- PLP1-Related Disorders
  https://www.ncbi.nlm.nih.gov/books/NBK1182

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28PLP1%5BTIAB%5D%29+OR+%28proteolipid+protein+1%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- PROTEOLIPID PROTEIN 1
  http://omim.org/entry/300401

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_PLP1.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=PLP1%5Bgene%5D
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=9086
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/5354
- UniProt
  http://www.uniprot.org/uniprot/P60201

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